WHAT IS CLAIMED IS:

1. An optical train for viewing an object, the optical train comprising:

an objective lens system for capturing an image of the object;

an ocular lens system that forms a final image of the object;

a relay lens system disposed along an optical path between the objective lens system and the ocular lens system;

wherein an intermediate image is formed within an optical element in at least one of the objective lens system, ocular lens system, and relay lens system.

2. The optical train of claim 1 wherein the optical element has an index of refraction greater than one.

3. The optical train of claim 1 wherein the intermediate image formed within the optical element is expanding.

4. The optical train of claim 1 wherein the optical element comprises a single lens, a rod lens, a compound lens, an extended lens, or a glass element.

5. The optical train of claim 1 wherein the optical element comprises a glass element coupled to a lens, wherein the intermediate image is formed in the glass element.

6. The optical train of claim 1, wherein the objective lens system comprises the optical element, wherein the relay lens system is separated from the objective lens system by an objective-relay gap, wherein the optical element is disposed adjacent the relay lens system, and wherein no intermediate image is disposed within the objective-relay gap.

7. The optical train of claim 1, wherein the ocular lens system comprises the optical element, wherein the relay lens system is separated from the ocular lens system by an ocular-relay gap, wherein the optical element is disposed adjacent the relay lens system, and wherein no intermediate image is disposed within the ocular-relay gap.

8. An endoscope comprising:

a shaft having a distal portion adjacent a distal end and a proximal portion adjacent a proximal end;

an ocular lens system disposed along the proximal portion;

a relay lens system disposed along the shaft between the proximal portion and the distal portion;

an objective lens system disposed along the distal portion, the objective lens system comprising a lens, the objective lens forming a first intermediate image within the lens.

9. The endoscope of claim 8, wherein the relay lens system is separated from the objective lens system by an objective-relay gap, wherein the lens is disposed adjacent the relay lens system, and wherein no intermediate image is disposed within the objective-relay gap.

10. The endoscope of claim 8, wherein the ocular lens system comprises a second lens, wherein the relay lens system is separated from the ocular lens system by an ocular-relay gap, wherein the second lens is disposed adjacent the relay lens system, and wherein no intermediate image is disposed within the ocular-relay gap.

11. The endoscope of claim 8, wherein the relay system comprises a plurality of axially separated relay units, the relay units being interchangeable and each relay unit comprising an axially symmetric set of relay lenses, wherein a relay gap is disposed between each pair of adjacent relay units so that an associated relay intermediate image is formed therein.

12. The endoscope of claim 8 wherein the relay system comprises a plurality of axially separated relay units, the relay units being interchangeable and each relay unit comprising an axially symmetric set of relay lenses, wherein an optical element is disposed between each pair of adjacent relay units so that an intermediate image is formed in the optical element.

13. The endoscope of claim 12 wherein the optical element has a refractive index greater than one.

14. A method of manipulating an image captured by a stereoscopic endoscope, the method comprising:

setting a diopters of the captured image;

independently altering the magnification of a image without significantly affecting the diopters;

adjusting the X-Y positioning of the image without introducing aberrations or affecting the diopters and magnification; and

rotating an orientation of the captured image, wherein rotating does not affect the diopters, magnification, and X-Y positioning of the captured image.

15. The method of claim 14 wherein setting comprises axially moving a plurality of lenses in an ocular system.

16. The method of claim 15 wherein the plurality of lenses comprises a first lens, a second lens, and a third lens, wherein altering the magnification comprises leaving the first lens stationary and axially moving the second and third lenses of the ocular system.

17. The method of claim 14 wherein adjusting the X-Y positioning comprises axially moving a lens of the ocular system orthogonal to an optical axis of the ocular system.

18. The method of claim 14 wherein rotating the image comprises turning a prism of the ocular system.

19. A method of manipulating an image within a stereoscopic endoscope comprising at least a first lens, second lens, a third lens and a prism positioned in an optical path of the ocular system, the method comprising:

moving the lenses of the ocular system along the optical path to adjust a diopters of the endoscope;

maintaining the position of the first lens and moving the second and third lens to adjust the magnification of the image;

adjusting an orthogonal positioning of the second lens to adjust the X-Y position of the image; and

rotating the prism to adjust the rotational orientation of the image.

20. The method of claim 19 wherein the ocular system further comprises a fourth lens, the method further comprising moving the fourth lens with the third lens.

21. The method of claim 19 comprising bending light rays with a wedge to form a stereo line of convergence.

22. The method of claim 19 wherein the second lens is a negative lens.

23. The method of claim 22 wherein the first lens and third lens are positive lenses.

24. A stereoscopic endoscope comprising:

a shaft comprising a proximal end and a distal end;

an objective lens system positioned at the distal end of the shaft;

a relay lens system disposed proximal of the objective lens system; and

an ocular lens system disposed on the proximal end of the shaft, wherein the ocular lens system comprises a prism having a wedge disposed at a proximal end that bends light rays exiting the ocular lens system to create a stereo line of convergence.

25. The stereoscopic endoscope of claim 24 wherein the wedge is positioned along a proximal surface of a prism in the ocular lens system.

26. The stereoscopic endoscope of claim 24 wherein the stereo line of convergence is approximately 50 mm from the distal end of the shaft.

27. The stereoscopic endoscope of claim 24 wherein the wedge is formed by grinding a proximal end of the prism.

28. The stereoscopic endoscope of claim 24 wherein the ocular lens system comprises a plurality of moveable lenses which provide independent adjustment of diopters and magnification.

29. The stereoscopic endoscope of claim 24 wherein the ocular lens system, relay lens system and ocular lens system are an integral unit.

30. A stereoscopic endoscope comprising:

a first channel comprising a first optical path and a first objective lens system optically coupled to a first ocular lens system through a first relay system;

a second channel comprising a second optical path and a second objective lens system optically coupled to a second ocular lens system through a second relay system;

wherein the first ocular lens system and the second ocular lens system each comprise a first and second positive lens and a negative lens disposed in the optical paths, wherein the negative lenses can be moved off the optical paths so as to stereo match the first channel with the second channel.

31. The stereoscopic endoscope of claim 30 wherein movement of the negative lens introduces no more than 1% aberrations.

32. The stereoscopic endoscope of claim 30 wherein the negative lenses are moved orthogonal to the optical axes.

33. The stereoscopic endoscope of claim 30 wherein the first ocular lens system and second ocular lens system each comprise a wedge which bends the light rays to create a stereo line of convergence.

34. The stereoscopic endoscope of claim 30 wherein the first and second relay lens systems each comprise a plurality of axially separated relay units, the relay units comprising an axially symmetric set of relay lenses, wherein an optical element is disposed between each pair of adjacent relay units so that an intermediate image is formed in the optical element.

35. A method of manipulating an image, the method comprising:

capturing an image with an objective lens system;

relaying an unbalanced imaged through a relay lens system to an ocular lens system; and

balancing the relayed image with the ocular system to produce a final image.

36. The method of claim 35 wherein relaying comprises forming an intermediate image in an optical element in the relay lens system.

37. The method of claim 36 wherein the optical element has a refractive index of greater than one.

38. The method of claim 36 wherein forming comprises preventing the image from being degraded by dust particles.

39. The method of claim 35 wherein the final image comprises less than 1% aberrations.

40. The method of claim 35 wherein balancing comprises setting diopters, adjusting magnification, adjusting linear positioning of the image, or adjust rotational position of the image.

41. The method of claim 35 wherein relaying comprises delivering an unbalanced intermediate image to the ocular lens system.

42. The method of claim 35 wherein balancing comprises compensating for distortions in the image.